Paspalum longiaristatum (Poaceae: Paniceae), a New Serpentine Endemic from Goiás, Brazil, and the First Awned Species in the Genus

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ABSTRACT. *Paspalum longiaristatum* of subgenus *Ceresia* is described and illustrated. It is the first known awned species in the genus and the first known annual species in the subgenus.

During routine determinations of grass specimens from the Brazilian state of Goiás, an unusual annual grass was studied, which we consider to represent an undescribed species of *Paspalum* L.

Paspalum longiaristatum Davidse & Filgueiras, sp. nov. TYPE: Brazil. Goiás: Niquelândia, Macedo, 14°18′S, 48°23′W, campo limpo, 13 abr. 1992, *T. S. Filgueiras 2277* (holotype, IBGE; isotypes, B, FLAS, ICN, ISC, K, MO, NY, P, SI, SP, R, RB, UB, UFG, US). Figure 1.

Ab omnibus speciebus *Paspali* gluma superiore et lemmate inferiore aristatis optime distincta. Speciebus subgeneris *Ceresia* (Persoon) Reichenbach simile sed habitu annuo, gluma superiore latissima super medianam partem absimile.

Tufted, delicate annual. Culms 15–36 cm tall, with 4–9 elongated internodes, branching sparingly from the lowermost nodes; internodes hollow, glabrous, stramineous to purplish; nodes papillose-hirsute, dark. Leaves mostly cauline; sheaths rounded on the back, papillose-hirsute with hairs mostly 0.5–1 mm long, the midrib prominent, the margins free; ligule a ciliate membrane, the membrane 0.5–0.8 mm long, the cilia 0.2–0.8 mm long; blades 4–8.2 cm long, 1–2 mm wide, flat, linear, papillose-hirsute, the marginal hairs to 3 mm long, slightly narrowed basally, acuminate apically, the midrib projected abaxially. Inflorescence of 1–2(–4) racemosely arranged, unilateral racemes, solitary from the uppermost leaf sheath; peduncle included to well exserted, glabrous to sparsely pubescent; rachis of the main axis 1.3–2 cm, glabrous to papillose, rarely extending to 3 mm beyond the base of the upper raceme as a naked bristle, with a tuft of hairs at the base of each raceme; racemes 2–6.8 cm long, arcuate, ascending at anthesis, divergent to slightly reflexed at caryopsis maturity, acuminate apically; raceme rachis extending beyond the spikelets to an acuminate apex, prominently winged, the wings 4.5–6 mm wide, completely enclosing the spikelets, the central portion herbaceous, green, inconspicuously nerved, the middle portion membranous, purple, nerveless, the outer portion membranous, colorless, nerveless, abaxially papillose-ciliate, adaxially glabrous, marginally minutely ciliolate; spikelets solitary, alternatively arranged on each side of the rachis, the pedicels 0.1–0.2 mm, puberulent. Spikelets 1.8–2.2 mm long, ca. 0.5 mm wide, dorsally compressed, abaxial, disarticulating below the glume and falling as one unit, narrowly elliptic-lanceolate in outline, awned, with 2 florets; lower glume absent; upper glume 1.8–2.2 mm, as long as the spikelet, hyaline, 3-nerved, somewhat narrowed to the base, convex in the lower ½, flat in the upper ½, densely pubescent on the back in the lower ¼–⅓, otherwise glabrous, the margins ciliate with hairs to 1 mm, the awn 6.0–12.2 mm, minutely antrorsely scaberulous, flexuous, not geniculate; lower floret sterile, consisting only of a lower, awned lemma 1.6–1.9 mm long, slightly longer than the upper floret, hyaline, 3-nerved, flat, densely pubescent on the back in the lower ⅛, otherwise glabrous, the margins ciliate, the awn 0.3–2 mm long, minutely antrorsely scaberulous, flexuous; upper floret 1.5–1.8 mm long, bisexual, slightly coriaceous, pale; upper lemma obscurely 5-nerved, acute, glabrous, smooth but minutely scaberulous along the margins in the upper ¼, the margins slightly inrolled in the upper ⅕; upper palea as long as the upper lemma; lodicules absent; stamens 3, the anthers 1.4–1.9 mm long, initially yellow, becoming purple with age; styles 2, separate; stigmas plumose, initially white, becoming yellowish with age; stamens and styles terminally exserted.

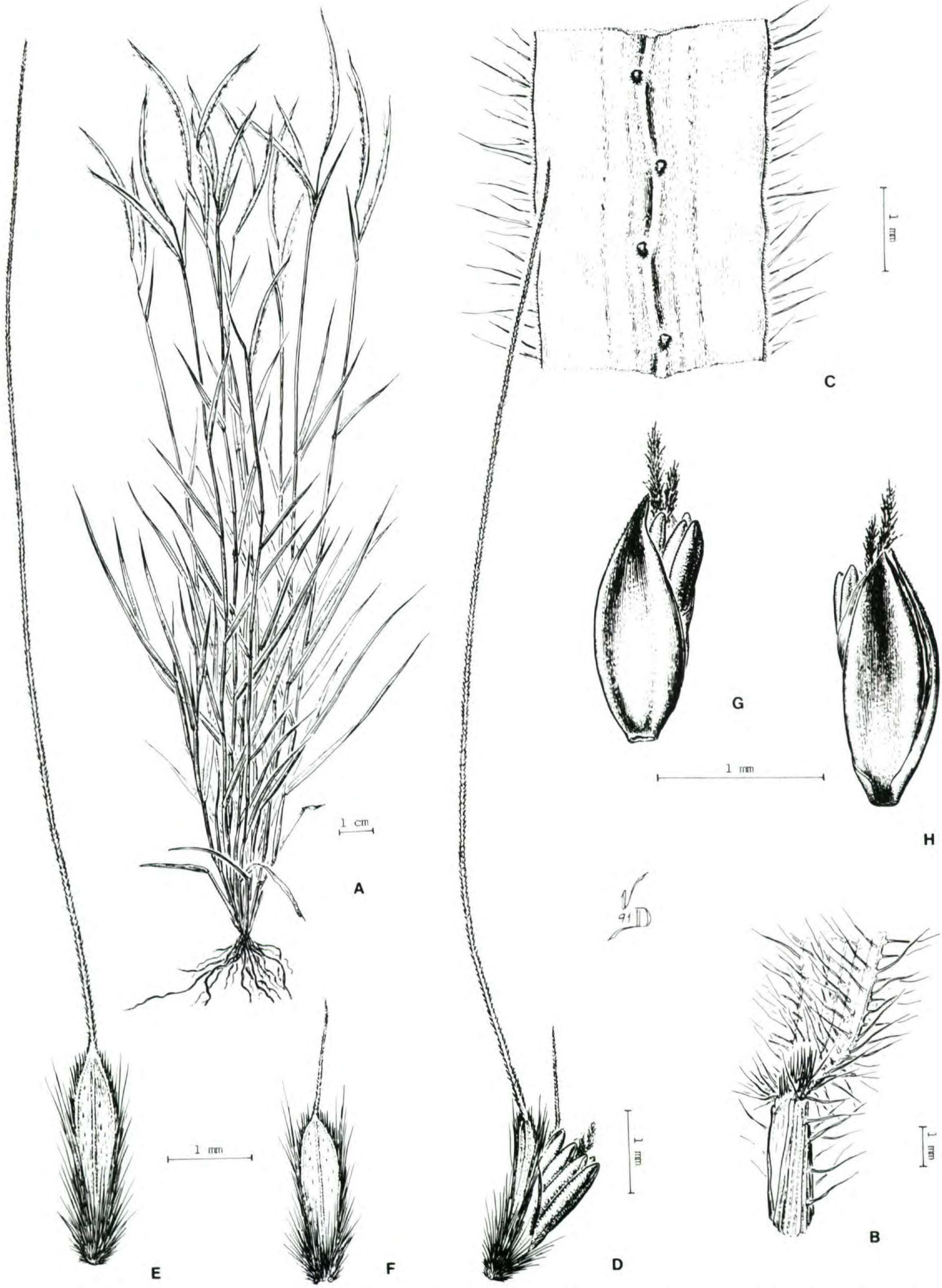

Figure 1. *Paspalum longiaristatum* Davidse & Filgueiras. —A. Habit. —B. Ligular area of the leaf. —C. Portion of the winged rachis with the spikelets fallen, showing the minute pedicel bases. —D. Spikelet at the beginning of anthesis. —E. Upper glume. —F. Lower lemma. —G. Upper floret, lemma side. —H. Upper floret, palea side. (Based on *Brooks et al. 144.*)

Caryopsis 1–1.2 mm; embryo $^{9}/_{10}$–$^{10}/_{10}$ as long as the caryopsis; hilum punctate, basal, ca. $^{1}/_{10}$ as long as the caryopsis.

Paspalum longiaristatum was found growing in huge populations in the campo limpo form of cerrado on serpentine soils. Plants were sampled in two random plots of one square meter each and gave the following results: 93 plants of *P. longiaristatum*, plus 5 plants of 4 other species; and 71 plants of *P. longiaristatum*, plus 4 plants of 4 other species.

The combination of abaxial, plano-convex spikelets, a slightly coriaceous upper lemma with its margins inrolled, broadly winged unilateral racemes, and absence of a lower glume point to a relationship with *Paspalum*.

Paspalum is a genus of about 330 species (Clayton & Renvoize, 1986), none of which have spikelets with awns or even the suggestion of a mucro. The conspicuously awned spikelets of *P. longiaristatum* thus make this a most incongruous species in the genus. For this reason generic status was seriously considered. However, this has not been adopted for the following reasons.

First, awn development is notoriously variable at the generic and higher taxonomic ranks in the family and may sometimes be quite variable within a species. Numerous instances are known of genera with a minority of awned species and a majority of awnless species or vice versa. Some examples of genera in the Paniceae with variable awn development among their species are *Digitaria* Haller, *Echinochloa* P. Beauvois, *Eriochloa* Kunth, *Hymenachne* P. Beauvois, *Melinis* P. Beauvois, *Mesosetum* Steudel, *Panicum* L., *Poecilostachys* Hackel, *Pseudoechinolaena* Stapf, *Rhynchelytrum* Nees, and *Urochloa* P. Beauvois.

Especially notable among these genera are the following two examples: (1) *Panicum aristellum* Doell has shortly awned glumes, the only awned species in a genus of approximately 470 species. Despite a membranous upper lemma, which might suggest a relationship to the genus *Hymenachne*, Zuloaga & Soderstrom (1985) maintained this species in *Panicum*. (2) *Digitaria aristulata* (Steudel) Stapf has an awned lower glume, but in other respects closely resembles other species of *Digitaria*. It is the only awned species in a genus of approximately 230 species. (We here recognize *Digitariella remotigluma* De Winter, an awned species with a strongly developed callus from southern Africa, as belonging in its own monotypic genus, although some recent authors (Clayton & Renvoize, 1986; Gibbs Russell et al., 1990) have merged it into *Digitaria*.)

In the Chloridoideae a similar example is known in *Eragrostis* Wolf, where the Namibian *E. aristata* De Winter is the only awned species in a genus of about 350 species, although there are numerous species with acuminate lemma apices, some of which grade into small awns, such as in *E. dinteri* Stapf. Thus, admitting awned species to otherwise large, awnless genera is not without precedent.

Emphasizing the fact of variability of awn development at another level is that the awn of the lower lemma of *P. longiaristatum* ranges from 0.3 to 2 mm in the same individual.

Second, there is little doubt about the relationship of the new species to the major infrageneric groups of *Paspalum*. The racemosely arranged racemes, the broad, partially purple, membranous rachis wings, the conspicuously hairy, lanceolate spikelets, the upper glume convex in the lower half and flat in the upper half, and the slightly coriaceous, pale upper lemma and palea indicate a close relationship to *Paspalum* subg. *Ceresia*. Although the characters just enumerated do not leave any doubt about its overall relationship with subgenus *Ceresia*, paradoxically this species does not seem closely related to any of the described species and can be immediately distinguished by its annual habit, small, awned spikelets, and the upper glume widest above the middle. No other annual species is known in this subgenus. Although the annual habit of the new species is also distinctive, it, like awn development, is a labile character that has repeatedly and independently evolved in many grass genera.

There is little doubt that if it were not for the prominent awns, this species would be easily accommodated in subgenus *Ceresia*. The single difference is therefore considered to be insufficient to establish a new, monotypic genus. The broader question of whether subgenus *Ceresia* itself deserves generic status is beyond the scope of the present study, but seems eminently worth reconsidering.

Other American genera with racemose inflorescences and broadly winged rachises that were considered in evaluating the relationship of this species include *Mesosetum* and *Thrasya*. *Mesosetum* can be excluded because its spikelets are adaxial with a developed lower glume, and the inflorescences are always solitary racemes (Filgueiras, 1989). *Thrasya* can be excluded because it is characterized by alternately adaxial and abaxial, awnless spikelets borne in one row due to the adnation of the pedicels of the spikelet pairs to the rachis (Burman, 1985).

The lack of functional lodicules seems to be associated with the terminal exsertion of the stamens and stigmas in the new species. This has also been observed in *Paspalum ceresia* (Kuntze) Chase, the type species of subgenus *Ceresia*, although some

specimens seem to have minute (nonfunctional?) lodicules. Other species of the subgenus have normally developed lodicules and terminally or laterally exserted stamens and styles.

At caryopsis maturity, when the leaves are also losing their chlorophyll, each raceme becomes divergent to slightly reflexed. As part of this process, the pulvinus at the base of each raceme twists so that the wing margins point upwards and the midrib of the raceme faces downwards. In this way a narrow, curved, troughlike structure is formed, which holds the spikelets, with the spikelet awns protruding beyond the raceme wings. Presumably this structure is functional in dispersal, but exactly how is not known, although T. Filgueiras observed in the field that the flexuous awns twist together, and because of this the spikelets tend to disarticulate in large groups.

The species name is meant to emphasize the prominently awned upper glume of this species.

Paratypes. BRAZIL. **Goiás:** Macedo, ca. 15 km N of Niquelândia, S-facing hill slope, stable peridotite/dunite-based scree and flat area below, ca. 500–800 m E of nickel workings, campo-cerrado, ca. 1,000 m alt., 14°18′S, 48°23′W, 21 Apr. 1988, *Brooks, Reeves, Baker & Dias Ferreira BRASPEX 144* (MO, NY, SI, UFG); a 18 km de Niquelândia, local chamado Macedo, 10 June 1992, *Filgueiras 2342* (BM, IBGE, ICN, ISC, K, MO, P, SI, SP, UB, US); Niquelândia, 14 Sep. 1991, *Filgueiras 2003* (IBGE, SP).

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